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Media Teleconference

"NASA to Provide
Mars Science Laboratory Launch Update"

Briefing Participants:

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ED WEILER, Associate Administrator,
Science Mission Directorate, NASA
MICHAEL MEYER, Mars Program Lead Scientist,
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Moderated by **DWAYNE BROWN**,
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3:00 to 3:30 p.m., EST
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P R O C E E D I N G S

TELECONFERENCE OPERATOR: Thank you for standing by. All parties will be able to listen only until the Q&A portion of today's conference. If you would like to ask a question during the Q&A portion, you may press Star-1 on your phone. To withdraw your question, you may press Star-2. Today's conference call is being recorded. If anyone has any objections, you may disconnect at this time.

I would now like to turn today's call over to Mr. Dwayne Brown. Sir, you may begin.

MODERATOR: Thank you.

Good afternoon, everyone. Again, my name is Dwayne Brown with the Office of Public Affairs. Welcome to the media telecon on the Mars Science Laboratory.

Ladies and gentlemen, we have a very tight 30-minute window. So we are going to cut right to the chase here. We are going to have a brief opening statement, and then we are going to go directly into the Q&A session.

There is a replay number for this telecon that will last for the remainder of the week. That replay number is 866-405-7299, again, 866-405-7299, and I will

give that number again at the conclusion of the telecon.

To give our opening statement will be Doug McCuistion, the director of the Mars Exploration Program here at NASA Headquarters, and joining Doug for the Q&A session will be Ed Weiler, the Associate Administrator for the Science Mission Directorate and Michael Meyer, the Mars Program Lead Scientist here at NASA Headquarters.

MR. McCUISTION: Hey, thanks, Dwayne.

Good afternoon, everyone. I wanted to let you know that today was our third regularly scheduled meeting with the Administrator on the progress and status of the Mars Science Laboratory. Again, this is the third one this year. These are regularly scheduled meetings, and we are planning to have more.

We have made significant technical progress on MSL since the May Meeting, which was the previous meeting. It has been very encouraging. There is a lot of hardware coming together, a lot of software working, and things are going quite well technically.

However, there are still continuing delays in some of those deliveries, both hardware and software, at the JPL. These delays in delivery basically result in

schedule pressure and some additional budget challenges for the Mars Science Laboratory.

The result of the meeting this morning was to continue unabated towards the launch in 2009. We will be working with the White House and Congress on the budget challenges over the next couple of months, but Congress to date has been very helpful and very supportive of these fiscal '08 problems we have had financially on MSL, and I hope that they continue to be so. I am sure that they will.

The next regular meeting with the Administrator is going to be in early January, and we will have another assessment at that time about schedule and budget for the Mars Science Laboratory's launch in October, September-October time frame of 2009.

Dwayne?

MODERATOR: Okay. Operator, let's go ahead and start the Q&A session.

TELECONFERENCE OPERATOR: As a reminder, if you would like to ask a question, you may press Star-1. To withdraw your question, you may press Star-2. Once again, any questions, please press Star-1 at this time.

Our first question comes from Andrew Lawler with the Science Magazine.

MEDIA QUESTIONER: Yes. Hi. Can you hear me okay?

MR. McCUISTION: Sound good.

MEDIA QUESTIONER: Okay, great.

What is the exact budgetary impact here?

MR. McCUISTION: Well, Andrew, at this point, we don't have exact numbers. We have been given an estimate from JPL. We are doing our own analyses on that, and we will be working with both the Office of Management and Budget and Congress on refinement of analyses and solution sets. So I can't pass the number --

MEDIA QUESTIONER: Can you give me the approximate number then?

MR. McCUISTION: At this point, I am not at liberty to be able to pass out approximate numbers or proposed or estimated numbers. No. I'm sorry, Andrew.

MEDIA QUESTIONER: So can you talk about what the original cost estimate is or was for MSL and then what it is up until the point that you can actually share with us what the cost is?

MR. McCUISTION: Oh, certainly. No problem there.

The mission was concerned by the agency to go forward into development with a budget of $1.6 billion. As of the most recent fiscal '08 budget increase, that number is approximately $1.9 billion. So we have had about a $300-million increase between confirmation, which was essentially in August of 2006, and today.

TELECONFERENCE OPERATOR: Our next question comes from Frank Morring with Aviation Week.

MEDIA QUESTIONER: Thank you.

Could you elaborate a little bit on the technical and schedule issues that remain and maybe start with the ones that are the most troublesome?

MR. McCUISTION: Sure, Frank. I can do that.

One that has been difficult for quite sometime now -- we do see a light at the end of the tunnel, but it has been difficult for quite some time now -- are actuators. "Actuators" are a fancy term for motors. Those motors are shoulder joint motors for the robotic arm, wrist joints, elbow joints. They turn the wheels. They drive the wheels. They are used in a number of different

applications.

Because of the mass of MSL and its size, those are reasonably complex motors, and they are difficult to produce. So those are still late, and those drive assembly in many areas, including another area is the Sample Handling System, Surface Sample Systems. The actuators are used in a number of places there, the drill and sample handling tools, and until we get those, we can't do final assembly. Those are actually our two largest areas of difficulty, Frank.

So the lack of those deliveries puts schedule pressure which in turn puts budget pressure on the system.

MEDIA QUESTIONER: How much wiggle room do you have in your schedule? What is your next milestone, for example, for going into testing? Where are you in spacecraft assembly? Where would you like to be? How much room do you have to make that launch date? Also, where are these actuators coming from?

MR. McCUISTION: That's a lot of questions. If I miss one, Frank, bear with me here.

Where we are is the rover assembly itself is largely complete. The cruise stage is largely complete,

and the descent stage, otherwise known as the "sky crane," is virtually complete.

We are getting ready to enter launch cruise environmental testing. That basically is to test the spacecraft assembly. So we stack the whole spacecraft up and test it as a unit as it would be launched and as it will spend its time, in other words, all buttoned up, during the cruise portion of the mission, in other words, getting from Earth to Mars.

That test sequence should begin in the late November time frame, and we are on track to do that. So we are where we would like to be with that. Rover surface environmentals begin next year.

The actuators aren't a problem because they are not used in most cases; in fact, in all cases in these assemblies during launch and cruise. So we have mast simulators, and it is not an issue.

So our next big milestone from a systems level is actually beginning that launch cruise environmental testing coming up, as I said, in about six or seven weeks.

The actuators are built by a small company in New York, Aeroflex. They are an outstanding company. They do

fantastic work, but these are very complicated actuators. Some of the most complicated actuators have in excess of 600 parts in each one, because they have a lot of torque they have to generate, and it is simple a development throughput problem at this point in the game.

We are helping them with additional manpower as we can, but they are the experts since they are building them.

So I think -- did I get all your questions, Frank?

[No response.]

TELECONFERENCE OPERATOR: Our next question comes from Brian Berger with SpaceNews.

MEDIA QUESTIONER: Thanks. This question is for Doug, of course.

So, with this decision to push on towards an October 2009 launch, does this represent a firm go-forward commitment on MSL? Or you mentioned a January meeting. Are you guys essentially just holding the status quo and kicking the can down the road a little bit longer?

MR. McCUISTION: Well, Brian, I wouldn't call it "kicking the can down the road."

MSL, we have had regular meetings with the Administrator all year, and of course, the agency's Program Management Council is the overseer of missions of this caliber. So we visit the Administrator and the agency's Program Management Council on a regular basis anyway.

Because of some of these financial difficulties and delivery difficulties, we have obviously upped our visibility at the agency level of progress that JPL is making on this mission.

So I wouldn't say we are kicking the can down the road. All indications are that they are still on track for the '09 launch. We have adequate margin to get to that. We got a robust test program, as confirmed by our standing review board, and that doesn't mean that there aren't challenges. As I said, we have deliveries that need to be made. We have testing that needs to be completed, and there can always be those unexpected problems where you get an alert on a part that is bad and you have to go change parts or rebuild boxes. Those kinds of things, you can never really plan for. You hope that they are not so catastrophic that it disrupts your schedule.

So right now, we are on progress, and we

scheduled another regular update to run every three to four months with the Administrator in early January.

TELECONFERENCE OPERATOR: Our next question comes from Mark Carreau with Houston Chronicle.

MEDIA QUESTIONER: Thank you very much.

I am wondering if you can discuss any other issues that affect the budget and schedule, besides the actuator example, and I gather, I am not quite clear really on how -- that, it sounds like is a development issue that is taking more time than originally thought, and that is affecting cost and schedule. Is that sort of clear on that issue?

MR. McCUISTION: Yeah. Schedule is money, and money is money. So, whenever you try to maintain schedule, it costs money to do that. So, in that regard, yeah, you are fairly on target.

Other, there have been a lot of challenges. One is called "PICA". When we had problems with our ablative material on the heat shield that protects the system on the way down though the Mars atmosphere, it failed the qualification testing last year. We made a very late, last November as a matter of fact, change to the material to a

new one called "PICA" which is Phenolic Impregnated Carbon Ablator, a couple of big words there, but nonetheless, it was a new material, and that is working beautifully. It is no longer on the critical path for schedule, but that cost us money.

I have mentioned the sampling handling systems on the surface. That is an issue. We are building a brand-new landing radar. People may remember difficulties we had with the Phoenix radar. This is a new radar. We have been testing it thoroughly, and it has cost us a little bit more than we had intended to spend, but that is a critical element. You don't land safely without that landing radar. It is going well.

I hate to come back to the actuators because you asked me other than. One issue, we found that the titanium gears in the actuators wouldn't handle the stresses that we were concerned about that this thing is going to see. We had to change to stainless steel gearing.

We had parachute issues this year that we didn't expect, where in a wind tunnel test, we had some damage done to a test parachute. After an extensive analysis and additional test program, we found that it was actually an

issue with the age of the test parachute, and we built new test parachutes and now are in good shape, but that was a schedule issues, as well as a budget issue.

So I hope those are good examples for you.

MEDIA QUESTIONER: Thank you.

TELECONFERENCE OPERATOR: Our next question comes from Bill Harwood, CBS News.

MEDIA QUESTIONER: Yeah. Hi, Doug. Just a quick one, a clarification to me.

What does the schedule show in terms of when you have to have a full complement of these actuators to make the window? Obviously, you think you are going to have them in time because you are pressing ahead, but give me some sense of what the window is on getting that stuff done.

Thanks.

MR. McCUISTION: Sure, Bill. We actually expect all the actuators to be in at the end of November, maybe the very beginning of December. That will allow us plenty of margin to be able to get these devices built, installed, and to the launch to integrate for surface environmentals that I mentioned in the spring.

So we do have some slack on that date, but we expect these things in end of November. We don't have much slack on them.

TELECONFERENCE OPERATOR: Our next question comes from Alicia Chang with Associated Press.

MEDIA QUESTIONER: Hi, Doug. Obviously, pressing ahead is going to cost some money. I am wondering if you can tell us where is this money going to be coming from.

MR. McCUISTION: Hi, Alicia.

Actually, I can't yet because we haven't fully resolved where it is going to come from. How it works is we put a proposal together that comes up to the right number of dollars, and then we have to work this with the Office of Management and Budget and Capitol Hill before we actually finalize that.

So, until we finalize those numbers, I can't actually discuss the sources.

MEDIA QUESTIONER: Well, just as a follow-up, I mean even if you are pressing ahead, does this cost increase mean that Congress can still cut the mission?

MR. McCUISTION: Well, the ability to cut this mission exists within the agency's authority, within OMB's

authority -- or I should say the White House's authority, as well as Congress not providing any additional funds.

This is a really important scientific mission, however. This is truly the push into the next decade for the Mars program and for the discovery of the potential for life on other planets, and it is an extremely critical mission to further the science goals of the agency.

Congress to date has been very supportive. They really have. I mean they have come through in short notice and in some difficult circumstances for them, as well as for us. So, actually, I fully believe that Congress will support us as we go forward on this because they recognize the importance of the mission as well.

MR. WEILER: Doug, this is Ed Weiler. Let me add a little bit to what you are saying to help with the question.

When we identify exactly how much it is going to cost in '09 extra, the longstanding policy within the Science Mission Directorate is to look within the Mars program first, and if we can't find enough money there, to look in the broader planetary program, but even with that, what we try to do before we start blindly canceling

missions or delaying missions, we look for other budget opportunities.

Sometimes a project isn't moving as fast, hasn't spent as much money, and they are carrying over more money than they really need to carry over. So there are certain accounting things you can do which can minimize impact to the missions.

I don't know. I can't say at this point in time, not knowing the exact number, whether we can find enough of these opportunities within the budget to avoid hits to other missions, but that would be my first goal.

In terms of continuing the mission, as Doug said, Congress has always been very supportive. It is very easy when you have overruns on big missions like this, especially if you are not involved with the mission and not involved with the management, to say, "Oh, why don't you just cancel this and start the next new one."

Well, I have some experience in that because I lived through Hubble, and I can't tell you how many times Hubble ran into problems, technical problems, and there was a hue and cry, "Well, cancel it, so we can start the next big telescope."

Well, if we did that every time and made the easy decision to cancer something, of course, we would have never launched Hubble, would have never launched quite a few things, Cassini, XF, and a few others. So it is easy to say let's just cancel it and move on, but we have poured over a billion-and-a-half dollars into this.

The science is critical. It is a flagship mission in the Mars program, and as long as we think we have a good technical chance to make it, we are going to do what we have to do.

TELECONFERENCE OPERATOR: Our next question comes from Kenneth Chang.

MEDIA QUESTIONER: Hi. Hello?

MR. McCUISTION: Yeah, we're here.

MEDIA QUESTIONER: Okay. Was there any discussion of delaying the launch at this point? I guess to what point. Is that something that, I guess, how late can you decide that you want to launch later?

MR. McCUISTION: Well, we actually started looking at launch opportunities other than '09 back in February as kind of a matter of course to know your alternatives if you really can't get there or if you have

serious problems that don't allow you to get there.

The decision to push the Hubble repair servicing mission is one of those. There is always an opportunity to launch, and you have to keep those in mind. You have to understand what your alternatives are.

So we have talked about that. We did discuss it a little bit today with the administrator because it is always a topic that if you have to go there, you need to know your option.

We are not addressing the budget on that at this point because we don't think we are going there, at least at this point in time we don't think we are going there. So we haven't really talked about that.

Decision point. We will talk about it again in January, if we need to. Theoretically, you can make that decision right up until you ship to the Cape or even at the Cape, but you don't want to do that. But our intent is to keep our eye on the ball and keep pressing for '09.

TELECONFERENCE OPERATOR: Our next question comes from Nell Greenfield, National Public Radio.

MEDIA QUESTIONER: Yes. Hi. Can you hear me?

MR. McCUISTION: Yes.

MEDIA QUESTIONER: Maybe I missed it because I had to press a little button and they talked to me for a while at the very beginning, but exactly how much more needs to be spent before this spacecraft can be sent off the Earth headed towards Mars?

MR. McCUISTION: Those numbers are being developed right now. We have some general estimates. We need to work those with the Office of Management and Budget and Capitol Hill before we publicly release the numbers or the solution set to those numbers.

It is clear. It is clear that funding is going to be needed if we go into '09, though.

TELECONFERENCE OPERATOR: Our next question comes from Todd Halvorson, Florida Today.

MEDIA QUESTIONER: Yeah. Can you guys hear me?

MR. McCUISTION: Yeah, Todd.

MEDIA QUESTIONER: Okay, great. I hate to do this, but I got totally bounced off this telecon at the very start. So I am going to ask Doug or Ed to kind of recap the big picture here for me. Thanks.

MR. McCUISTION: Okay. The big picture is we had the third meeting with the Administrator this year. We

have these regularly scheduled for roughly every three to four months to go through MSL project status and the progress we are making.

They have made incredible progress technically. A lot of hardware has been delivered, but there's still hardware deliveries and software deliveries that are outstanding. Those outstanding items are putting schedule and budget pressure on us for the '09 launch. Right now, they can make '09, and we are going to continue towards the 2009 launch at this point.

That is the summary for you, Todd.

TELECONFERENCE OPERATOR: Our next question comes from Keith Cowing with NASAWatch.com.

MEDIA QUESTIONER: Hi. Can you hear me?

MR. McCUISTION: Yeah, Keith.

MEDIA QUESTIONER: Okay. A question for Ed Weiler.

It was stated a little while ago that the original cost for the MSL was $1.6 billion, and that the cost growth is taking it up $300 million to 1.9.

However, just before you came back to NASA, there was an internal SMD study done which started with the

$650-million figure that NASA bought off on after the Decadal Survey. If you are going from 650 as a starting point to 1.6, that is a billion-dollar difference. I am just wondering why you guys won't fess up to the fact that that is where you started, and that the cost grew substantially before you redid this study to only take it from, depending on who you talk to, 1.4- or $1.6-billion mark.

MR. WEILER: Okay. I think that is a good question, Keith, and it is a good historical comment. If you ask what projects cost, almost any project in planetary or astronomy, what the cost is when somebody is writing a proposal and is very hopeful and gives you the most optimistic possible cost, and I don't know whether 600 million was right or whatever the number was, but the way NASA accounts to the Congress, what the NASA policy is approved by Congress is that the cost that NASA commits to is the cost that is approved at the entrance into development, Phase C. That is the first time that you have got a semi-reliable cost.

Anybody who tells you that they can estimate cost based on PowerPoint vugraphs, well, I have got some stock

to tell you, you know. Basically, you do not really understand the cost of a mission until you get to about Phase C, which is what we call "development," and that is what we have to report to Congress, and that is what Doug is correctly quoting.

TELECONFERENCE OPERATOR: Our next question comes from Irene Klotz with Reuters.

MEDIA QUESTIONER: Thanks very much.

I am not really clear what extra money at the problem would accomplish. Is it basically like double shifts or around 24-hour work with this company in New York and JPL, and are you sure that putting more money at the problem is actually going to fix it?

MR. McCUISTION: That is a very good question, Irene, and you are right on the money.

As schedule pressure grows, you have to increase staffing, or you can't let staffing go until the parts come in that they actually need to do the assembly work on. So you are right. Some of this is accelerating test programs, which means we either need to add a shift or add people to a shift.

In the case of the company in New York, we

actually have several folks from JPL that have gone out there. That company is also working multiple shifts now to get the hardware produced on the schedule that we need it, and that is exactly the type of resolutions that are required to by-schedule back, if you will, to maintain your schedule. That's right.

TELECONFERENCE OPERATOR: Our next question comes from Craig Covault with Aviation Week.

MEDIA QUESTIONER: The next question is for Ed Weiler, and I apologize for going off the Mars reservation here just a bit, but it concerns the Outer Planet Flagship.

Has there been any basic principle about any tradeoffs in the budget between MSL and getting the Outer Planet Flagship mission started? And just briefly, what is the status of selection of Outer Planet Flagship planet targets, if you will?

MR. WEILER: Let me answer the second question first, Craig.

I believe -- and Doug, correct me or, Mike, correct me if I am wrong, but I believe we are headed towards a decision between the Titan Orbiter Mission versus the Europa Mission sometime this fall. I think it is

October-November time frame.

Is that correct, guys?

MR. McCUISTION: It is actually January.

MR. WEILER: January? Okay.

MR. McCUISTION: Yeah.

MR. WEILER: And in terms of the second question, whether Mars MSL would impact Europa or Titan, again, I can't give you -- first of all, there isn't much money in '09 for this study. So that is not going to be a prime source of funding. So the answer is probably no on that.

TELECONFERENCE OPERATOR: Our next question comes from Tariq Malik from Space.com.

MEDIA QUESTIONER: Thank you, and forgive me if asked before, but I was just curious exactly when the '09 window will close and when the next window would open if you had to look at them. Then I was just curious if you can kind of compare the complexity of this laboratory to the last rovers to land. That would help a lot. Thank you.

MR. McCUISTION: Okay. The answer to the first question is the window currently is September 15th to October 15th. So that is the window that we are working

on. We are looking at can you extend the window, but don't have the answers to that entirely yet.

The next window is 2011. So Mars comes around every 26 months, which is why a slip to 2011 is not desirable if we can help it.

I'm sorry. Could you repeat the second question?

TELECONFERENCE OPERATOR: One moment, please.

MR. WEILER: How it compares to Mars rovers and complexity, Doug.

MR. McCUISTION: Oh, thank you. I'm sorry. I just missed it.

This is a considerably more complex mission. That's part of the issue is it is very difficult to estimate costs on something that you haven't done before, which is typical of flagship missions, since we do challenge ourselves with capability.

The Spirit and Opportunity rovers are about 150 kilograms in total mass. This mission is about 990 kilograms in total mass. The reason the mass is up is to be able to carry a larger payload. So we are going to go from roughly 5 kilograms of scientific instruments to about 75 kilograms of scientific instruments. So this is going

to be basically a small chemistry laboratory that is mobile on the surface of Mars, an incredible feat.

Viking was also an incredible scientific feat in that regard, but it wasn't mobile, and this one is. So it is quite a leap in technology and capability.

MR. WEILER: Just as a mention, that the percentage of the payload, there is more payload devoted toward scientific instruments.

MR. McCUISTION: Right. That is largely due to a new landing system where we are not carrying as much dead mass around with us.

MR. WEILER: Right.

TELECONFERENCE OPERATOR: Our next question comes from Ashley Yeager with Nature Magazine.

MEDIA QUESTIONER: Hi. Can you hear me?

MR. McCUISTION: Yeah.

MEDIA QUESTIONER: Okay. I was curious. Is there anything in future missions when trying to predict these costs and stay on budget, is there anything that NASA can do to prevent these overruns in the future or anything that JPL can do?

MR. McCUISTION: Well, that's a good question.

We do intend to spend some time on lessons learned with ways we can improve our processes. A couple of them right off the top are very good technology development programs early in its life. You want to make sure that you have plenty of time in the early formulation phases of the Mission Phase A and Phase B, and so there are a few procedural things that we can do to improve that.

Some missions have already done that. JWST, the James Webb Space Telescope, actually has made a significant investment in technologies, much more than MSL had, and I think that we would probably have been better off if we had done those types of things.

Juno is another one where we have a risk reduction phase for the mission that actually will help it improve and improve the fidelity of its mission and capabilities before we actually get into this development phase.

So there are a number of things that we can do, and we intend to look more deeply at other things too.

TELECONFERENCE OPERATOR: Our next question comes from Nell Greenfield Boyce, National Public Radio.

MEDIA QUESTIONER: Yeah. Hi. Can you hear me?

MR. McCUISTION: Yes.

MEDIA QUESTIONER: Just to bring this up again, I mean the press conference for this said the meeting, the telecon was to discuss technical and budget issues, and we have heard a lot about technical things, like types of materials, stainless steel, different ablators, but you know, with these budget issues, people keep asking questions, and they keep not really getting an answer.

I mean, so is the answer that you all are concerned about cost overruns and you have estimates for the cost overruns, but in response to reporters' questions, you would not release that information?

Thank you.

MR. McCUISTION: Yeah, I can address that.

Let's see. So the budget news here is we have budget pressures that continue. We have put about $300 million more in this mission to date than what we confirmed it at two years ago.

We know that if we are going to launch in 2009 or 2011, additional budget resources will be necessary to do that. The exact numbers and the sources of those, we cannot release until we get approval through the Office of

Management and Budget and Congress.

So, hopefully, that summary of our budget situation helps.

TELECONFERENCE OPERATOR: Our next question comes from Devin Powell with New Scientist.

MEDIA QUESTIONER: Hi. Can you hear me?

MR. McCUISTION: Yeah.

MEDIA QUESTIONER: I just wondered. You mentioned delays in both hardware and software aspects, and I was wondering what are some of the software problems that you guys are encountering.

MR. McCUISTION: The interaction of all these systems, whether they are motor controllers to drive all these actuators or whether they are the interface software for different instruments or whether it is the robotic arm or the remote sensing mast, the software is pretty complex.

We also have field programmable GatorRays that are very complex as well, and they get software or firmware embedded in those. Now, when you burn those, when you put the program in them, they are only used once. So, when you burn the FPGA, you got to make sure the software is

correct. So it has taken us a little bit longer. It has taken JPL a little longer than expected to get all those software tools put together and get the code written properly, so that it has a high reliability.

We have added a software release or two as well, to make sure we have those correct.

TELECONFERENCE OPERATOR: Our last question comes from Stephen Clark, Spaceflight Now.

MEDIA QUESTIONER: Hey, guys. Can you hear me?

MR. McCUISTION: Yeah.

MEDIA QUESTIONER: I was wondering exactly what do you expect to learn between now and your meeting in January with Administrator Griffin, and also, are these high-level meetings typical of NASA programs with the Administrator several times per year?

MR. McCUISTION: Let's see. What we expect to learn is to get some of the critical deliveries. I know we keep coming back to actuators, but we spend a lot of time talking about actuators around here, and they actually are one of the scheduled drivers.

So, as I mentioned earlier, we do expect to have the majority, if not all the actuators, delivered by the

end of November. That is very important in getting through this.k

We expect to be able to get into our launch cruise environments which is also critical to keeping schedule. There are a number of testbeds that we are going to get up and running. There is avionics hardware deliveries that we expect, new updates to flight software. So those pieces need to come along, and many of those are critical to retaining the margin we have and making the launch.

Are reviews at this level typical in the agency? Yes, they are. When the agency's Program Management Council has the authority over a mission, they are what is called the "governing PMC," the Administrator essentially or the Deputy Administrator are in charge of that. So regular reviews with those senior officials is typical, and that is for what is called "flagship missions" which exceed a billion dollars in cost.

So, right out of the starting gate, MSL was under the review of the Administrator once confirmed, once we knew it was over a billion.

TELECONFERENCE OPERATOR: I would now like to

turn today's call back over to Mr. Dwayne Brown.

MODERATOR: Thank you.

Again, I would like to repeat the replay number that we will be running all this week, 866-405-7299, 866-405-7299.

A reminder that on Tuesday at 12:30, October 14th, 12:30 p.m., Eastern, the Hubble spacecraft, there will be a media telecon. So please look out for the media advisory on that. Again, a Hubble media telecon, 12:30 p.m., Eastern, next week, Tuesday, October 14th.

Of course, go to www.NASA.gov for the latest updates on all of our missions.

Thanks for joining us on this Friday. Have a good weekend.

Operator?

TELECONFERENCE OPERATOR: Thank you for joining in today's call. All parties may disconnect at this time.

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